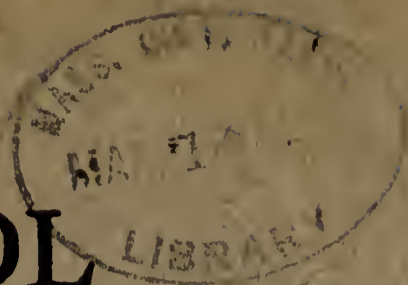
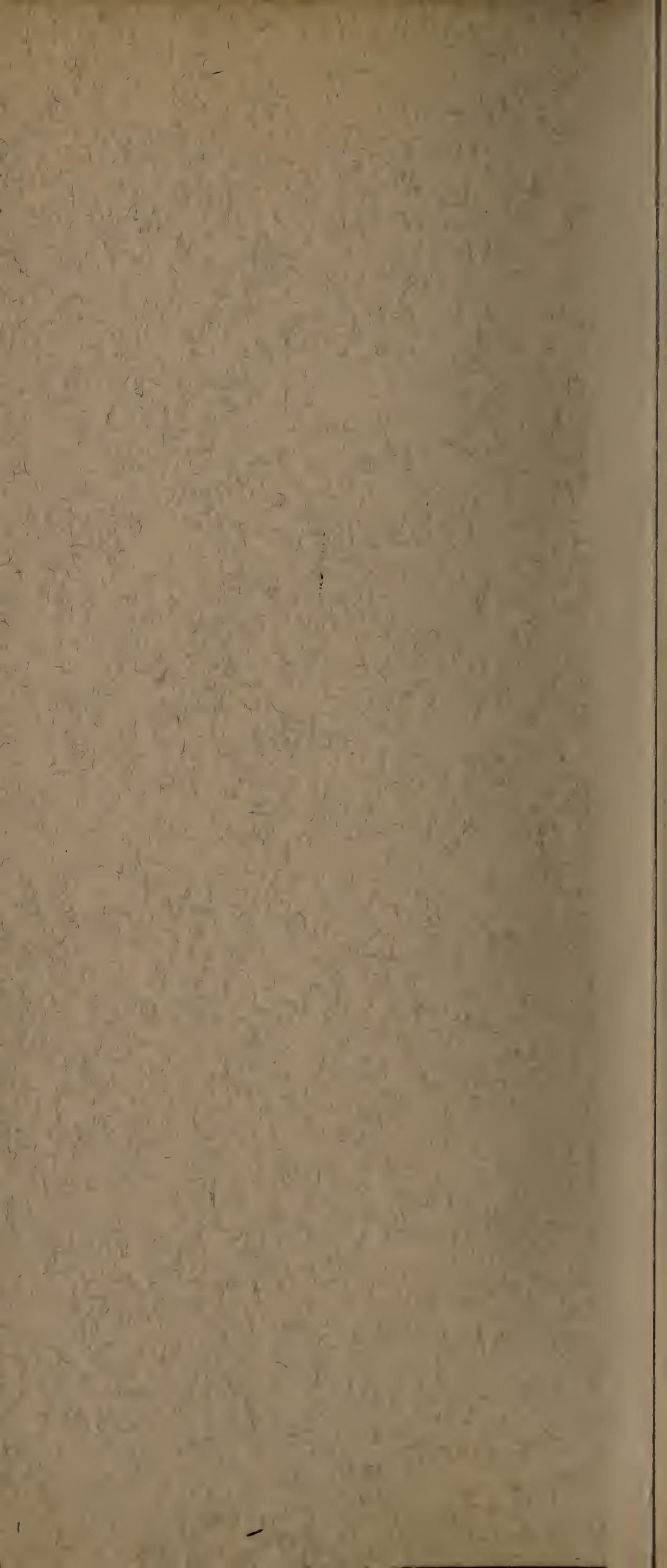


June 1912

ALCOHOL
FOR
INDUSTRIAL
PURPOSES



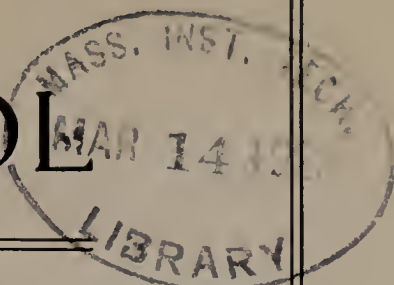


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ALCOHOL

FOR

INDUSTRIAL
PURPOSES



U. S. Industrial Alcohol Co.

FORMULAS
AND
SPECIFICATIONS

Synopsis
of
Rules and Regulations
Prescribed
By

THE U. S. INTERNAL
REVENUE BUREAU

Controlling
Its
Distribution and Use

✓

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BY
U. S. INDUSTRIAL ALCOHOL Co.

INDUSTRIAL ALCOHOL

U. S. INDUSTRIAL ALCOHOL COMPANY

EXECUTIVE OFFICE:
27 WILLIAM STREET
NEW YORK

MANUFACTURING PLANTS

NEW ORLEANS
BUFFALO

BALTIMORE
BOSTON
PEORIA

DISTRIBUTING WAREHOUSES

NEW YORK
PHILADELPHIA
NEW ORLEANS
ST. LOUIS
PITTSBURGH
CINCINNATI
ST. PAUL
ATLANTA
MEMPHIS

DALLAS
CHICAGO
BALTIMORE
BOSTON
KANSAS CITY
DETROIT
PEORIA
CLEVELAND
OMAHA



PURE ETHYL ALCOHOL

UNDENATURED Ethyl Alcohol (non-beverage) may be used for manufacturing purposes under permit issued by the U. S. Bureau of Internal Revenue after the filing of a bond. Non-beverage Alcohol withdrawn for manufacturing purposes is subject to a tax levied by the Internal Revenue Bureau. Alcohols which are not subject to Government tax are:—

ALCOHOL FOR EXPORT.

ALCOHOL FOR USE OF THE U. S. GOVERNMENT.

ALCOHOL FOR USE OF THE STATES OR ANY MUNICIPAL SUBDIVISION.

ALCOHOL FOR USE IN HOSPITALS, SANATORIA AND ALLIED INSTITUTIONS. . .

ALCOHOL FOR USE OF COLLEGES AND UNIVERSITIES.

ALCOHOL FOR USE OF LABORATORIES IN SCIENTIFIC RESEARCH.

ALCOHOL DENATURED.

The grades of Pure Ethyl Alcohol manufactured by this Company are as follows:—

U. S. P.

U. S. GOVERNMENT SPECIFICATIONS.

CHEMICALLY PURE 96%.

ABSOLUTE.

*SPECIAL GRADES FOR SPECIAL PURPOSES.

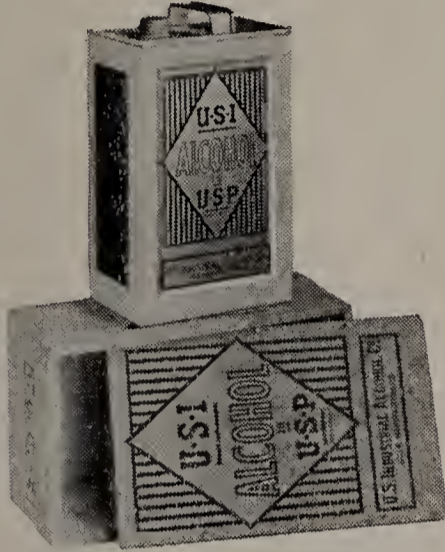
*We produce a number of such special grades conforming to special requirements as to quality and strength and will be pleased to confer with you as to the suitability of our products for your purposes or the adaptation of our Alcohols to new uses.

Upon request we will be pleased to prepare the necessary forms ready for signature in order that a permit for use of Tax Free or Tax Paid non-beverage alcohol may be obtained.

U. S. INDUSTRIAL ALCOHOL COMPANY
27 WILLIAM STREET
NEW YORK CITY

U. S. P. ALCOHOL

THIS Company has devoted considerable time and thought to the manufacture of a high grade alcohol for pharmaceutical and drug purposes which conforms to the U. S. P. specifications. Similarly packages have been developed which maintain the high standards of quality under which the alcohol is manufactured.



Our One-Gallon Package

One and five gallon original packages have been perfected which are securely boxed and sealed. The cans are filled under the direction of the U. S. Internal Revenue Officials by automatic machinery. Each one gallon can contains 6.8 net pounds (exactly one gallon) of 190 proof alcohol and each five gallon can contains 34 net pounds (exactly five gallons) of 190 proof alcohol. The alcohol being thus weighed automatically assures that each can contains full measure and is not subject to temperature changes as in the case of volume measure.

The cans after being filled and sealed are packed in wooden boxes or crates approved by the Interstate Commerce Commission.



Our Five-Gallon Package

COMPLETELY DENATURED ALCOHOL

COMPLETELY denatured alcohol is ethyl alcohol which has been rendered entirely unfit for beverage use by the addition of denaturants prescribed by the U. S. Bureau of Internal Revenue. Such alcohol may be used by the manufacturer or general public without filing a bond or obtaining permit. Completely Denatured Alcohol is not subject to tax by the Internal Revenue Bureau.

Completely Denatured Alcohol may be bought and sold without keeping records or making reports to the Internal Revenue Bureau. Dealers may transfer from one package to another without restrictions other than the following:

Each package containing 5 wine gallons or more must be marked with:

Name and address of dealer.

Formula number.

Proof or strength of the alcohol, the words "completely denatured alcohol" in letters not less than 1 inch in height.

Each package containing less than 5 wine gallons of alcohol must contain a label as follows:



POISON

COMPLETELY DENATURED ALCOHOL

is a violent poison. It cannot be applied externally to human or animal tissues without seriously injurious results. It cannot be taken internally without inducing blindness and general physical decay, ultimately resulting in death.

No additional wording may be used without specific authority from the Commissioner of Internal Revenue.

The following are a few of the general uses of Completely Denatured Alcohol:—

ALCOHOL LAMPS	GAS MANTLES
ANNEALING AND CLEANING	HATS
JEWELRY	INKS
ANTI-FREEZING SOLUTIONS FOR	INSECT POWDERS
AUTOMOBILE RADIATORS	LACQUERS
BLENDED FUELS	MOTOR POWER
BRONZING FLUIDS	OIL REFINING
CARBON REMOVER	PAINTS
CARTRIDGES	PAINT AND VARNISH
CEMENTS	PREPARING SUBJECTS FOR EX-
CHAFING DISHES	HIBITION PURPOSES
CLEANING FABRICS	SHOE BLACKING, ETC.
CLEANING AND POLISHING BRASS,	SOAP
GLASS, SILVER, SHOES, ETC.	SOLIDIFIED ALCOHOL
DIPPING FLUIDS	SOLDERING FLUX
DISINFECTANTS	STARCH
DYES, STAINS	STARTING GASOLINE LAMPS
ENAMELS	TANNING
ENGINE CLEANING	TESTING FRUIT
ETCHING	VARNISHES
FOR SCIENTIFIC PURPOSES	VARNISH REMOVERS
FUMIGATING LAMPS	WATERPROOFING COMPOUNDS
	WINDOW CLEANSER

FORMULAS FOR COMPLETELY DENATURED ALCOHOL

UNLESS otherwise provided, alcohol to be known as completely denatured alcohol will be denatured under one of the following formulas:

FORMULA 1

To every 100 parts by volume of ethyl alcohol there shall be added 10 parts by volume of approved wood alcohol and one-half part by volume of approved benzene.

FORMULA 2

To every 100 parts by volume of ethyl alcohol there shall be added 2 parts by volume of approved wood alcohol and one-half of 1 part by volume of approved pyridin bases.

FORMULA 3.

To every 100 parts by volume of ethyl alcohol add 5 parts by volume sulphuric ether, 2 parts by volume benzene, and 1 part by volume pyridin.

FORMULA 4

To every 100 parts by volume of ethyl alcohol there shall be added:

Two and five-tenths (2.5) parts by volume of approved benzol.
Five-tenths (0.5) parts by volume of nitrobenzol.

Two-tenths (0.2) parts by volume of approved pine oil (steam distilled).

FORMULA 5

To every 100 parts by volume of ethyl alcohol there shall be added:

2 parts by volume of approved wood alcohol.

$\frac{1}{4}$ part by volume of approved pyridin bases.

$\frac{1}{2}$ part by volume of approved benzene (kerosene).

FORMULA 6

To every 100 parts by volume of ethyl alcohol add:

2 parts by volume of approved benzol.

$\frac{1}{4}$ part by volume of approved pyridin bases.

$\frac{1}{2}$ part by volume of approved benzene (kerosene).

The benzol used shall conform to the specifications set forth for the quality of benzol used in the compounding of specially denatured alcohol Formula No. 2-B.

(Specifications for approved denaturants will be found on p. 25.)

While Completely Denatured Alcohol may be used for many purposes, there are some cases where its use should not be attempted. Alcohol so denatured cannot safely be used as a bathing or massage alcohol or in other preparations for use on the body.

In manufacturing processes Completely Denatured Alcohol should not be used where the quality of the product is an important factor. The Internal Revenue Regulations provide that the denaturants used shall be crude or partially refined products.

Pyro (C. D. No. 5) is recommended for use as an auto freeze for automobile radiators. Formula No. 6 may also be used for the purpose. The other formulas are less desirable for the purpose because of greater corrosive action or disagreeable odor.

In shellac cutting the choice of formula is important. Pyro (formula No. 5) is recommended for this purpose. The resulting solution flows from the brush more smoothly and results in a more uniform film than obtained by the use of any other C. D. formula. Formulas No. 4 and 6 are sometimes used for the purpose, but Pyro (formula No. 5), gives better results and is free from any objectionable or sickening odor.

SPECIALLY DENATURED ALCOHOL

SPECIALLY denatured alcohol is ethyl alcohol which has been rendered partially unfit for beverage purposes by the addition of denaturants approved by the U. S. Bureau of Internal Revenue. Such alcohol may be used only as specifically authorized and under Internal Revenue Bureau permit and approved bond.

The use of specially denatured alcohol is encouraged by the bureau, for manufacturing processes wherever possible. They provide that alcohol 190 proof (95%), 192 proof (96%) or absolute (99-100%) may be denatured. Such alcohol is not subject to tax, but may be used *only under permit and bond*.

SAMPLES

Samples of specially denatured alcohol not exceeding 5 gallons may be secured by applying to the local collector of Internal Revenue on official Form 1512.

PERMIT

Applications for permit to use specially denatured alcohol should be made to the local collector of Internal Revenue on Form 1479.

BOND

Applications for bond must be made on Form No. 1480. The size of the bond is determined by the amount of alcohol to be used during a 30-day period.

Where the quantity involved is less than 100 wine gallons, the penal sum of the bond will be \$500, and for other quantities in accordance with the following schedule:

100 to 200 wine gallons.....	\$1,000	8,901 to 10,000 wine gallons..	45,000
201 to 425 wine gallons.....	2,000	10,001 to 11,000 wine gallons.	50,000
426 to 650 wine gallons.....	3,000	11,001 to 12,000 wine gallons.	55,000
651 to 900 wine gallons.....	4,000	12,001 to 13,000 wine gallons.	60,000
901 to 1,100 wine gallons....	5,000	13,001 to 14,250 wine gallons.	65,000
1,101 to 2,200 wine gallons...	10,000	14,251 to 15,400 wine gallons.	70,000
2,201 to 3,250 wine gallons...	15,000	15,401 to 16,500 wine gallons.	75,000
3,251 to 4,400 wine gallons...	20,000	16,501 to 17,800 wine gallons.	80,000
4,401 to 5,250 wine gallons...	25,000	17,801 to 18,800 wine gallons.	85,000
5,251 to 6,600 wine gallons...	30,000	18,801 to 20,000 wine gallons.	90,000
6,601 to 7,750 wine gallons...	35,000	20,001 to 21,000 wine gallons.	95,000
7,751 to 8,900 wine gallons...	40,000	More than 21,000 wine gallons.	100,000

The manufacturer must set aside on his manufacturing premises a locked room in which to store his supply of specially denatured alcohol.

If the application is approved by the Internal Revenue Department a permit Form 1481 will be issued to the manufacturer to use specially denatured alcohol and the manufacturer should then make application on Form 1477 for a permit to procure such specially denatured alcohol from a specified denaturer or dealer. This permit, when issued, remains in force indefinitely and supplies of specially denatured alcohol may thereafter be procured without further application.

Upon request we will be pleased to prepare the necessary forms ready for signature, in order that a permit for use of Tax Free Specially Denatured Alcohol may be obtained.

NEW FORMULAS FOR SPECIALLY DENATURED ALCOHOL

THE Commissioner of Internal Revenue will consider any formula for special denaturation that may be submitted by any manufacturer in any art or industry, and will determine—(1) whether or not the manufacture in which it is proposed to use the Alcohol belongs to a class in which tax free Alcohol withdrawn under the provisions of the law can be used. (2) Whether or not it is practicable to permit the use of the proposed denaturant and at the same time properly safeguard the Revenue. But one special denaturant will be authorized for the same class of industries, unless it can be shown that there is good reason for additional special denaturants.

RULES AND REGULATIONS

IN the use of many of the above mentioned specially denatured alcohols, the U. S. Internal Revenue Bureau has made special requirements to meet certain conditions. If you contemplate the use of any of the above formulas, and you will indicate to us the formula you desire to use, we will gladly inform you as to any restrictions that may surround its use.

If you desire to use Denatured Alcohol for a legitimate manufacturing purpose which is not covered by the above authorized uses, we will be glad to take up the case with a view of securing authorization from the U. S. Internal Revenue Bureau for such use.

FORMULAS FOR SPECIALLY DENATURED ALCOHOL

Specifications for approved denaturants will be found on page 25.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
1	To 100 gallons of ethyl alcohol add 5 gallons of approved wood alcohol. May be shipped in tank cars, drums or barrels.	Acetaldehyde.
1	"	Acetphenitidin.
1	"	Aconite.
1	"	Adeps lanae.
1	"	Alkaloids and alkaloidal salts.
1	"	Alterin.
1	"	Aletrin.
1	"	Analytical work.
1	"	Arabinose.
1	"	Aloin.
1	"	Antipyrin.
1	"	Apocynin.
1	"	Arbutin.
1	"	Asclepiadin.
1	"	Avenin.
1	"	Artificial flowers.
1	"	Ammunition.
1	"	Atophan.
1	"	Aspirin.
1	"	Acetanilid.
1	"	Artificial feathers.
1	"	Baptisin.
1	"	Barometer and thermometer tubes.
1	"	Benzoic acid.
1	"	Benzaldehyde.
1	"	Beta Naphthol.
1	"	Beta naphthol benzoate.
1	"	Brushes.
1	"	Benzidine.
1	"	Betanaphthol Salicylate.
1	"	Benzyl cyanide.
1	"	Bottle caps.
1	"	Benzoin.
1	"	Benzol.
1	"	Benzon.
1	"	Chelonin.
1	"	Cimicifugin.
1	"	Collodion.
1	"	Collodion corn remedy.
1	"	Concentrations (non-liquid).
1	"	Confectioner's colors.
1	"	Coumarin.
1	"	Cutlery.
1	"	Cutting oils.
1	"	Cocoa butter.
1	"	Composition billiard and pocket balls.
1	"	Chloroform.
1	"	Compasses.
1	"	Creosote carbonate.
1	"	Colors and bronze powders.
1	"	Chloral hydrate.
1	"	Camphor synthetic.
1	"	Cements.
1	"	Caustic potash.
1	"	Dental alloy.
1	"	Dandelion, Digitalis, Resin of (solid and powdered extracts of).
1	"	Disinfectant germicide.
1	"	Door checks.
1	"	Dimethylglyoxime.
1	"	Dinitro Toluene (a dye).

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
1	To 100 gallons of ethyl alcohol add 5 gallons of approved wood alcohol. May be shipped in tank cars, drums or barrels.	Dye stuffs.
1	"	Digestive ferments.
1	"	Diethylaniline.
1	"	Dextrine.
1	"	Dextrose.
1	"	Ethyl acetate.
1	"	Ethyl propionate.
1	"	Ethyl butyrate.
1	"	Essential oil orris.
1	"	Ethyl chloride.
1	"	Embalming fluid.
1	"	Eosine (a dye).
1	"	Ethyl bromide.
1	"	Ether.
1	"	Ethyl aniline.
1	"	Enamel.
1	"	Extracting glycerine from distillery slop.
1	"	Fireworks.
1	"	Filaments for incandescent lamps.
1	"	Formaldazone.
1	"	Fertilizer.
1	"	Fulminate of mercury.
1	"	Formaldehyde.
1	"	Gaduol.
1	"	Galactose.
1	"	Glass.
1	"	Glass enamel.
1	"	Gelatine capsules.
1	"	Gentian (solid extract).
1	"	Glycerophosphates.
1	"	Guaiacol.
1	"	Guaiacol carbonate.
1	"	Gum and pyroxylin solutions.
1	"	Gallocyanine (aniline dye).
1	"	Gas mantles.
1	"	Hats.
1	"	Heliotropin.
1	"	Hydrastis (alkaloid of).
1	"	Hexachlorbenzol.
1	"	Insecticides.
1	"	Inks.
1	"	Inulin and iriscin.
1	"	Imitation leather.
1	"	Isinglass.
1	"	Imitation Ivory goods.
1	"	Jalapin (non - liquid concentration of).
1	"	Jewelry and watches.
1	"	Japans.
1	"	Lacquers, pastes and varnishes from soluble cotton.
1	"	Leather substitutes.
1	"	Leather goods finish.
1	"	Lacquers.
1	"	Liquor cresolic comp.
1	"	Lernlose.
1	"	Lysol.
1	"	Mandrake (powdered and solid extract of).
1	"	Mirrors.
1	"	Moldings and Picture frames.
1	"	Monobromated camphor.
1	"	Moth repellent.
1	"	Mica insulators.
1	"	Mucilage, paste and glue.
1	"	Motor fuel.
1	"	Metal.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
1	To 100 gallons of ethyl alcohol add 5 gallons of approved wood alcohol. May be shipped in tank cars, drums or barrels.	Melibiose.
1	"	Maltose.
1	"	Marmose.
1	"	Mannite.
1	"	Nonscatterable glass.
1	"	Nitroso Betanaphthol.
1	"	Nitrocellulose (solution and solvent of)
1	"	Orthotoluolsulfamid.
1	"	Oils, greases, lubricants and soluble thread cutting oils.
1	"	Oleoresins.
1	"	Optical goods.
1	"	Paints.
1	"	Paraffin.
1	"	Phenolphthalein.
1	"	Phenacetine.
1	"	Phytolascin (concentration of).
1	"	Photographic dry plates and films.
1	"	Print paper and enlargements.
1	"	Postal card colors.
1	"	Polish preparations for metals and furniture.
1	"	Pepsin, podophyllin and similar products.
1	"	Potassium hydroxide.
1	"	Podophyllin resin and similar products.
1	"	Powdered Extracts.
1	"	Powdered Drugs.
1	"	Photographic engravings.
1	"	Phenyl cinchoninic acid.
1	"	Pyroxylin cements.
1	"	Plumbing material.
1	"	Paramidophenol.
1	"	Potassium cyanate.
1	"	Pencils.
1	"	Paper.
1	"	Refining mineral oils.
1	"	Refining precious metals.
1	"	Resin of Scammony.
1	"	Resorcin.
1	"	Raffinose.
1	"	Resins.
1	"	Salol.
1	"	Saccharose.
1	"	Sorbit.
1	"	Stanolind.
1	"	Synthetic perfume bases.
1	"	Santonine and strychnine.
1	"	Solid extracts.
1	"	Soaps (transparent and liquid).
1	"	Shellac varnish.
1	"	Shoe polish.
1	"	Silverware and bronze.
1	"	Smokeless powder.
1	"	Surgical ligatures.
1	"	Soldering flux.
1	"	Sodium benzoate.
1	"	Sulphonic acid and paraffin.
1	"	Salicylic aldehyde.
1	"	Solution and solvent of nitro cellulose.
1	"	Solidified alcohol.
1	"	Salophen.
1	"	Saponin.
1	"	Salicylic acid.
1	"	Saccharine.
1	"	Shellac thinner.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
1	To 100 gallons of ethyl alcohol add 5 gallons of approved wood alcohol. May be shipped in tank cars, drums or barrels.	Stains.
1	"	Sterilizing solution for corks.
1	"	Silk fabrics.
1	"	Synthetic mustard oil.
1	"	Shampoo, liquid.
1	"	Shampoo, jelly.
1	"	Stencil paper.
1	"	Trioxyaline.
1	"	Tannic acid.
1	"	Tin foil and bottle caps.
1	"	Terpin hydrate.
1	"	Textile cleansing soap.
1	"	Toludin.
1	"	Tolidin.
1	"	Transparent paper.
1	"	Transparent soap for water - proofing cement.
1	"	Trinitrotoluol.
1	"	Theobromine.
1	"	Thermostatic devices.
1	"	Tobacco.
1	"	Trehalose.
1	"	Uric acid.
1	"	Varnish remover.
1	"	Viburnum (Concentration).
1	"	Vegetable colors.
1	"	Water colors.
1	"	Wood finish.
1	"	Wool fat.
1	"	Washing lenses.
1	"	Wood filler.
1	"	Watches.
1	"	Waterproof fiber signs.
1	"	Xylose.
2	To 100 gallons of ethyl alcohol add 7 pounds of camphor and 5 gallons of commercially pure methyl alcohol. May be shipped in tank cars, drums or barrels.	Pyralin and similar products. Cement and celluloid products.
2a	To 100 gallons of ethyl alcohol add 2 gallons of approved wood alcohol and 2 gallons of benzol. May be shipped in tank cars, drums or barrels.	Celluloid. Pyralin and similar products. Ethyl acetate. Nitrocellulose lacquer. Varnishes. Paste.
2b	To 100 gallons of ethyl alcohol add $\frac{1}{2}$ gallon benzol. May be shipped in tank cars, drums or barrels.	Diamidophenol. Beta Naphtha centralites. Arsphenamine. Acetic ether. Acetphenetidin (conditional). Arsphenamine. Beta naphtha centralites. Dyes. Diethyl barbituric acid (barbital). Diamidophenol. Diethylphthalate. Dimethylsulphate. Ethyl esters of cinnamic, lauric, benzoic, and pelargonic acids. Ethyl palmitate. Ethyl sulphate (for use in manufacture of acetphenetidin). Fulminate of mercury.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
2b	To 100 gallons of ethyl alcohol add $\frac{1}{2}$ gallon benzol. May be shipped in tank cars, drums or barrels.	Guaiacol. Hydroquinone. Ketone Michellers. Lacquers. Laboratory experiments. Leather dressing. Metol. Motor fuel. Neoarsphenamine. Nitrocellulose products. Nitrous Ether. Phenacetin. Pyroxylin plastics. Paramidophenol. Phenylacetic acid. Picric acid test for U. S. Government. Powdered chemicals Sulphuric ether connection with production of powder). Synthetic camphor. Saccharine. Smokeless powder. Trinitrotoluol. Viscaloid. White petroleum oils. Ethyl sulphate.
3	To 100 gallons of ethyl alcohol add six and one-half gallons of the following mixture: Five gallons of commercially pure methyl alcohol; 1 gallon of castor oil; one-half gallon of 36° Baume caustic soda lye. May be shipped in barrels only.	Transparent Soap. Shampoo. Shampoo jelly.
3a	To 100 gallons of ethyl alcohol add five gallons of commercially pure methyl alcohol. May be shipped in tank cars, drums or barrels.	Cutting oils. Shampoo. Shampoo jelly. Transparent soap. Deodorants. Experimental purposes. Disinfectants. Furniture polish. Films. Gradometers. Photographic films. Photographic emulsions. Synthetic mustard oil.
3b	To 100 gallons of ethyl alcohol add 1 gallon of liquid pine tar. May be shipped in tank cars, drums or barrels.	Liquid soap. Shampoo. Shampoo jelly. Smelling salts. Toilet preparations.
4	To 100 gallons of ethyl alcohol add one gallon of the following solution: Five gallons of an aqueous solution containing 40 per cent. nicotine; 0.4 pound acid, yellow dye (fast yellow Y); 0.4 pound tetrazo brilliant blue, 12 B. Conct.; water to make 100 gallons. May be shipped in tank cars, drums or barrels.	Cigars. Cigarettes. Smoking and chewing tobacco. Deodorants.
4 Alt.	To every 100 gallons of ethyl alcohol add one gallon of the following solution: 5 gallons of an aqueous solution containing 40 per cent. nicotine; 3.6 ounces, more or less, of methylene blue; water to make 100 gallons.	
5	To 100 gallons of ethyl alcohol add 65 pounds of sulphuric ether, 3 pounds of cadmium iodide and 3 pounds of ammonium iodide. May be shipped in barrels only.	Photo enlargements. Photoprints. Photo engravings. Photographic collodion.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of.
6	To 100 gallons of ethyl alcohol add 3 gallons commercially pure methyl alcohol and one-half gallon pyridin bases. May be shipped in tank cars, drums or barrels.	Fulminate of mercury.
6a	To 100 gallons of ethyl alcohol add 15 gallons of condensed fumes, recovered in the process of manufacture. May be shipped in tank cars, drums or barrels. The use of this alternative formula will be restricted to factories operating in connection with either a distillery or a central denaturing bonded warehouse.	Fulminate of mercury.
6b	To 100 gallons of ethyl alcohol add one-half gallon of pyridin bases. May be shipped in tank cars, drums or barrels.	Acetphenetidin. Chloral hydrate. Hydroquinone. Guaiacol. Dichlorethane. Ethyl acetate. Ethyl Butyrate. Ethyl chloride. Para fulminate or mercury. Paraphenitidin. Acetic ether. Ethyl bromide.
7	Revoked.	Revoked.
8	To 100 gallons of ethyl alcohol add one gallon of pyridin bases and one gallon of benzol. May be shipped in tank cars, drums or barrels.	Ethyl chloride. Fine chemicals. Sulphonmethane. Dyes.
9	To 100 gallons of ethyl alcohol add 10 gallons of acetone and 2 gallons of petroleum naphtha. May be shipped in tank cars, drums or barrels.	Monobromated camphor. Purification of rubber. Santonine. Strychnine. Tannic acid.
10	To 100 gallons of ethyl alcohol add two gallons of approved wood alcohol and 2 gallons of benzol. May be shipped in tank cars, drums or barrels.	Ethyl acetate (conditional). Lacquers, pastes and varnishes from soluble cotton. Hydrosulphate. Sodium. Japans.
11	To 100 gallons of ethyl alcohol add 100 pounds of sulphuric ether and 10 pounds of cadmium iodide. May be shipped in barrels only.	Photographic collodion. Photo engraving. Photo prints.
12	To 100 gallons of ethyl alcohol add one gallon of pyridin bases and two gallons of coal-tar benzol. May be shipped in tank cars, drums or barrels.	Imitation leather (see also formula 12a). Soluble cotton.
12a	To 100 gallons of ethyl alcohol add 5 gallons of benzol. May be shipped in tank cars, drums or barrels.	Acetphenetidin. Barbital. Hydrazoanisol. Imitation leather. Milk protein. Paranitrophenatol. Refining potassium and sodium hydrate. Saponification of the waxes of acid-fast bacteria. Smokeless powder. Terpin hydrate. Trinitrotoluol. Benzoic acid ethyl ester. Dye intermediates. Imitation rubber. Experimental purposes Lacquer solutions. Urea.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
12a	To 100 gallons of ethyl alcohol add 5 gallons of benzol. May be shipped in tank cars, drums or barrels.	Anhydrous soap. Sutures and ligatures. Tubs (collapsible). Sanatogen. Citronellol. Geraniol.
13	To 100 gallons of ethyl alcohol add 5 gallons of sulphuric acid and 5 gallons of sulphuric ether. May be shipped in barrels only.	Sulphuric ether (see also formula 13a).
13a	To 100 gallons of ethyl alcohol add 10 gallons of sulphuric ether. May be shipped in drums only.	Anesthetic ether. Arsphenamine. Celery oil. Certified food colors. Chemical preparations. Collodion. Dry extracts for food products. Ethereal oil. Neosalvarsan. Ncoarsphenamine. Protargentum. Photo engravings. Sodium ethyl sulphate. Sulphuric ether. Salvarsan.
14	To 100 gallons of ethyl alcohol add 5 gallons commercially pure methyl alcohol and 10 pounds anhydrous zinc chloride. May be shipped in tank cars, drums or barrels.	Ethyl chloride (see also formula 1 and 8).
15	To 100 gallons of ethyl alcohol add 3 gallons of sulphuric acid and 1 gallon of kerosene. May be shipped in barrels only. (After the tax-free alcohol has all been converted into nitrous ether it will be permissible for the manufacturer to add alcohol in order to dilute the product so that it may be more readily transported, or for other purposes, but such added alcohol must in all cases be tax-paid alcohol).	Ethyl bromide. Ethyl chloride. Nitrous ether. Pure acetic ether.
16	To 100 gallons of ethyl alcohol add 5 gallons commercially pure methyl alcohol and 2 gallons benzol. May be shipped in tank cars, drums or barrels.	Adalin. Alkaloids. B-naphthol. By-products from distillery slop. Glycerophosphates. Lacquers for food containers. Phenyleinchoninic acid Acetanilid. Acid Salicylic. Acetphenetidid. Ammonium. Benzonaphthol. Betanaphthol benzoate. Cocaine. Diacetylmorphine. Ethyl morphine. Homatropin. Morphine. Salicylate cocaine. Sodium. Strontium. Salol (see also special Formula 1) chemicals. Sajodin. Veronal.
17	To 100 gallons of ethyl alcohol add 0.05 gallon (6½ fluid ounces) of animal oil (Dipples). May be shipped in tank cars, drums or barrels.	Acetphenetidid. Acetic ether. Chloral hydrate. Dichlorethane. Ethyl acetate. Ethyl chloride. Ethylene gas. Paraphenetidin.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
18	To 100 gallons of ethyl alcohol of not less than 100 degrees proof add 100 gallons of vinegar, containing not less than 9 per cent acetic acid. May be shipped in barrels only. (The use of formula No. 18 will be restricted to factories operated in connection with denaturing plants.)	Acetate of lime. Acetone. Vinegar.
19	To 100 gallons of ethyl alcohol add 100 gallons of ethyl ether. May be shipped in drums only.	Artificial silk. Backing of films. By-products from distillery slop (see also formula 16). Collodion. Ethyl acetate. Iodizer. Solvent for nitrocellulose. Photofilms. Photo engravings.
19a	To every 100 gallons of pure ethyl alcohol add not less than 100 gallons or not more than 150 gallons of ethyl ether. May be shipped in drums only.	Artificial silk in connection with collodion. Conditional.
20	To 100 gallons of ethyl alcohol add 5 gallons crude chloroform. May be shipped in tank cars, drums or barrels.	Chloroform (conditional).
21	To 100 gallons of ethyl alcohol add 100 gallons of a solution containing not less than 4½% acetic acid. (Conditional.) May be shipped in barrels only.	Acetate of lime (conditional).
22	To 100 gallons of ethyl alcohol add 10 gallons solution formaldehyde conforming to specifications of U. S. P. Amount of denatured alcohol to be used in finished product not to exceed 20 per cent. May be shipped in barrels only.	For preserving formaldehyde, U.S.P. Embalming fluid.
23	To 100 gallons ethyl alcohol add 10 gallons acetone and 2 gallons benzol. May be shipped in tank cars, drums or barrels.	Liniment for external use only.
23a	To every 100 gallons of pure ethyl alcohol add 10 gallons acetone, U.S.P. May be shipped in tank cars, drums or barrels.	Liniments and lotions for external purposes. Solid and powdered extracts.
23b	To every 100 gallons pure ethyl alcohol add 15 pounds of camphor, U.S.P., 2 pounds of menthol crystals U.S.P., 3 pounds of carbolic acid U.S.P. May be shipped in barrels only.	Lotions for external purposes only.
23c	To every 100 gallons pure ethyl alcohol add 10 lbs. carbolic acid, U.S.P., 15 pounds resorcinol, U.S.P., 5 pounds oil of wintergreen, U.S.P., or methyl salicylate, U.S.P. May be shipped in barrels only.	Lotions for external purposes only.
23d	Twenty pounds tannic acid, U. S. P. and 25 pounds gum Camphor U. S. P. May be shipped in barrels only.	Liniments and lotions for external use only.
24	To 100 gallons ethyl alcohol add 29 gallons of sulphuric acid. (Conditional.) May be shipped in glass only.	Phenacetin. Ethyl acetate (conditional). Ethyl butyrate. Ethyl propionate. Ethyl valerate.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
25	To 100 gallons of ethyl alcohol add 20 pounds of iodine, and 15 pounds of potassium iodide. May be shipped in barrels (special) or glass.	Tincture of iodine, U.S.P. Tr. Iodi fortier, N.F. Tr. Iodine Churchill's. Tr. Iodine 3½ %.
25 Alt.	A solution composed of 20 pounds Iodine U. S. P., 15 pounds Potassium Iodide U. S. P., 15 pounds Water. May be shipped in barrels only.	Tincture of Iodine, U.S.P. tr. iodi Fortier, N.F. tr. iodine Churchill's tr. iodine 3½ per cent.
26	To 100 gallons of ethyl alcohol add 5 gallons aniline oil. May be shipped in tank cars, drums or barrels.	Ethylaniline and Diethylaniline. Dyes and intermediates.
27	To 100 gallons of ethyl alcohol add 1 gallon oil of rosemary; 30 pounds of camphor. May be shipped in tank cars, drums or barrels.	Soap liniment, U.S.P. Chloroform liniment, U.S.P. Liquid and green soap, in accordance with U.S.P. except as to content of camphor and oil of rosemary.
27a	To every 100 gallons of ethyl alcohol add 35 pounds camphor, U.S.P. and 1 gallon oil of cloves, U.S.P. May be shipped in tank cars, drums or barrels.	Manufacture of liniments for external purposes only.
28	To each 100 gallons of ethyl alcohol add 10 gallons of approved benzol. May be shipped in tank cars, drums or barrels.	Motor fuel (conditional).
28-a	To every 100 gallons of ethyl alcohol of not less than 198° proof add 1 gallon of gasoline.	Motor fuels.
29	To 100 gallons of ethyl alcohol add 5 gallons of an alcoholic solution of acetaldehyde containing not less than 20 per cent. of acetaldehyde. May be shipped in tank cars, drums or barrels.	Aldehydes (conditional). Glacial acetic acid (conditional). Ethyl butyrate. Propionate. Valerate. Conditional.
30	To 100 gallons of ethyl alcohol add 10 gallons pure methyl alcohol. May be shipped in tank cars, drums or barrels.	Chemical and physical laboratory purposes, only in accordance with the provisions of T. D. 2793 (no recovery for reuse). Photo dry plates. Mfg. vegetable oils. Varnish. White petroleum oils. Conditional.
31	To 100 gallons of ethyl alcohol add 100 pounds of soap and 100 pounds of glycerine, U.S.P. May be shipped in tank cars, drums or barrels.	Tooth paste.
31a	To 100 gallons of ethyl alcohol add 100 pounds of glycerine, U.S.P., 20 pounds of hard soap, good toilet grade, containing not in excess of 5 per cent. of moisture. May be shipped in tank cars, drums or barrels.	Tooth paste.
31b	To 100 gallons of ethyl alcohol add five and one-half gallons oil of peppermint, U.S.P., 1¼ gallons eucalyptol, U.S.P., and four pounds menthol crystals, U.S.P. May be shipped in tank cars, drums or barrels.	Tooth paste.
31c	To every 100 gallons pure ethyl alcohol add 33 pounds citric acid, U.S.P., 33 pounds menthol, U.S.P. May be shipped in barrels only.	Tooth paste.
32	To 100 gallons of ethyl alcohol add 5 gallons sulphuric ether. (Conditional.) May be shipped in tank cars, drums or barrels.	Ethylene. Conditional.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
33	To every 100 gallons of pure ethyl alcohol there shall be added 30 pounds of methyl violet. (Conditional.) May be shipped in barrels only.	Meat branding inks (conditional).
33a	Thirteen pounds erythrosin..... The erythrosin used in the above formula will be that described as No. 517 in A. G. Green's edition of the "Schultz-Julius Systematic Survey of the Organic Coloring Matters," published in 1904. May be shipped in barrels only.	Incorporating certified color in food products, no alcohol to appear in the finished product when prepared for use.
34	To every 100 parts by volume of pure ethyl alcohol add 5 parts by volume of tetrachlorethane. May be shipped in tank cars, drums or barrels.	Artificial silk.
35	To every 100 gallons pure ethyl alcohol add 35 gallons of ethyl acetate. May be shipped in tank cars, drums or barrels.	Acetparamidophenol-salol and candy glaze.
35a	To every 100 gallons of pure ethyl alcohol add 5 gallons of ethyl acetate. May be shipped in tank cars, drums or barrels. NOTE: The above formula will only be authorized in manufacturing processes in which alcohol is handled in a closed system of pipes and vessels. Recovery will be permitted where desired. In making application for this formula detailed blue prints of the apparatus employed, together with a description of the process must be submitted. The ethyl acetate used in the above formula shall be that quality specified in the United States Pharmacopoeia, ninth revision, page 531.	Pectin; ethyl acetate.
36	To every 100 gallons pure ethyl alcohol add 3 gallons stronger ammonia water, U.S.P. May be shipped in tank cars, drums or barrels.	Ammonia Liniment. Disinfectant. Shaving cream. Stain remover. Smelling salts. Toilet preparations.
37	To every 100 gallons pure ethyl alcohol add 45 ounces eucalyptol, U.S.P., 30 ounces thymol, U.S.P., 20 ounces menthol, U.S.P. May be shipped in tank cars, drums or barrels.	Antiseptic solutions for external purposes.
38	To every 100 gallons of pure ethyl alcohol add 5 gallons of a water solution of 60 ounces of zinc chloride, U.S.P., and 10 pounds of any one of the following: methyl salicylate, U.S.P., oil of wintergreen, U.S.P., oil of cassia, U.S.P., oil of cloves, U.S.P., or oil of peppermint, U.S.P. May be shipped in barrels only.	Mouth washes and dentifrices.
38a	To every 100 gallons of pure ethyl alcohol add 5 ounces menthol crystals, U.S.P., 9 ounces emetine hydrochloride, U.S.P., 16 pounds benzoic acid, U.S.P. May be shipped in barrels only.	Liquid dentifrices.
38b	Amended. Five pounds each of any two of the following: Oil of Wintergreen, U. S. P. or methyl-salicylate, U.S.P., oil of cloves, U.S.P., oil of peppermint, U.S.P., oil of cassia, U.S.P., oil of eucalyptus, U.S.P., oil of rosemary, U.S.P., oil of lavender, U.S.P., menthol crystals, U.S.P. May be shipped in barrels only. Anyone desiring to use this formula must specify in the application which two substances from the above list are selected.	Amended — Mouth washes and dentifrices.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
38c	One hundred and sixty ounces menthol, U.S.P., 1.25 gallons solution formaldehyde, U.S.P. May be shipped in barrels only.	Dentifrices.
38d	Forty ounces of menthol, U.S.P., and 2½ gallons of formaldehyde, 40 per cent, U.S.P. May be shipped in barrels only.	Mouth washes and dentifrices.
38e	Five gallons of fluid extract ipecac, U.S.P., or 40 pounds of ipecac, U.S.P. May be shipped in barrels only.	Alcoholic barbers' supply preparations.
39	To every 100 gallons of pure ethyl alcohol add 9 pounds sodium salicylate, U.S.P., 1¼ gallons fluid extract quassia, U.S.P., and 1 gallon of either of the following: acetone, U.S.P., or iso-propyl alcohol. May be shipped in barrels only.	Barber's supply preparations.
39a	To every 100 gallons of pure ethyl alcohol add 1 gallon of either of the following: acetone, U.S.P., or iso-propyl alcohol and 60 ounces of any one of the following U.S.P. alkaloids or salts: quinine, quinine bisulphate, quinine hydrochloride, cinchonidine, or cinchonidine sulphate. May be shipped in barrels only.	Barber's supply preparations.
39-a Mod.	To every 100 gallons of pure ethyl alcohol add 1 gallon of either of the following; acetone, U.S.P., or iso-propyl alcohol and 60 ounces of any one of the following U.S.P. alkaloids or salts: quinine, quinine bisulphate, quinine hydrochloride, cinchonidine, or cinchonidine sulphate, and three eighths of a gallon (three pints) of approved benzol. May be shipped in barrels only.	Rubbing alcohols, liniments.
39-b	To every 100 gallons of pure Ethyl Alcohol add 2½ gallons of Diethylphthalate $C_6H_4(CO_2C_2H_5)_2$. May be shipped in tank cars, drums or barrels.	Perfumes, toilet water, barber supplies and lotions.
39-b Mod.	To every 100 gallons of pure Ethyl Alcohol add 2½ gallons of Diethylphthalate $C_6H_4(CO_2C_2H_5)_2$, and three-eighths of a gallon (three pints) of approved benzol. May be shipped in tank cars, drums or barrels.	Rubbing alcohols, liniments.
40	To every 100 gallons of pure ethyl alcohol add 3 ounces av. brucine sulphate and ½ gallon of either of the following: acetone, U.S.P., or iso-propyl alcohol. May be shipped in barrels only.	Perfumes and high grade toilet preparations.
41	Twenty pounds menthol crystals, U.S.P. May be shipped in tank cars, drums or barrels.	Solid confections and lozenges.
42	To every 100 gallons of Pure Ethyl Alcohol add eighty grams potassium iodide, U.S.P., and 109 grams red mercuric iodide, U.S.P. May be shipped in barrels only.	Sterile surgical ligature.
43	To every 100 gallons of pure Ethyl Alcohol add thirty pounds methyl salicylate, U.S.P. May be shipped in barrels only.	Emulsions which contain no alcohol in the finished products.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of
44	To every 100 gallons of Pure Ethyl Alcohol add ten gallons of normal butyl alcohol. May be shipped in tank cars, drums or barrels.	Spirit varnishes, varnish removers, and in similar preparations.
45	To every 100 gallons of Pure Ethyl Alcohol add three hundred pounds of refined shellac.	Candy glaze.
46	To every 100 gallons of Pure Ethyl Alcohol add twenty-five fluid ounces phenol, U.S.P., 4 fluid ounces oil of wintergreen or methyl salicylate, U.S.P. May be shipped in barrels only.	An antiseptic, sterilizing, and bathing alcohol for use by visiting nurse associations, public nursing associations, clinics, and dispensaries exclusively.
47	Seven gallons fluid extract of arnica flowers, National Formulary, third edition. May be shipped in barrels only.	Tincture of arnica and other liniments and lotions for external purposes.

Formula No.	COMPOSITION OF FORMULAS	Authorized for use in manufacture of

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DENATURANT SPECIFICATIONS

ALDEHYDES, FORMULA 6a

THE condensed liquid from the process must contain not less than 4 grams per 100 c. c. of mixed aldehydes calculated as acetic aldehyde.

The use of this alternative formula will be restricted to factories operating in connection with either a distillery or a central denaturing bonded warehouse.

ANILINE OIL

The aniline oil is to contain not less than 95% pure aniline (straw or reddish color) of specific gravity of 1.026 at 15° C.; B.P. 181° C.

ANIMAL OIL (DIPPLES)

The animal oil must conform to the following specifications:

Color.—The color shall be a deep brown.

Boiling Point.—When 100 c. c. of the animal oil are subjected to distillation in the same manner as prescribed for the determination of the boiling point of wood alcohol not more than 5 c. c. should distill over below 90° C. and not less than 50 c. c. at 180° C.

Pyrol Reaction.—Two and one-half c. c. of a 1 per cent. solution of the animal oil in 90 per cent. of alcohol by volume are diluted to 100 c. c. with alcohol. A splinter of pine wood, previously moistened with concentrated hydrochloric acid, is dipped into 10 c. c. of this solution, containing 0.025 per cent. of animal oil. After a few minutes the splinter should show a distinct red coloration.

Reaction with Mercuric Chloride.—Five c. c. of the 1 per cent. solution of the animal oil in 90 per cent. of alcohol by volume, when treated with 5 c. c. of a 2 per cent. solution of mercuric chloride in alcohol should give immediately a voluminous flocculent precipitate. Five c. c. of the 0.025 solution of the animal oil, when treated with 1 c. c. of the 2 per cent. solution of mercuric chloride, should show at once a distinct turbidity.

BENZINE

The benzine submitted for approval must be a hydro-carbon product derived either from petroleum or coal tar. If derived from petroleum, it must have a specific gravity of not less than 0.800. If derived from coal tar, it must have a boiling point of not less than 150° C or more than 200° C.

It must be of such character as to impart a decided odor to ethyl alcohol when mixed with it in the proportion of one-half of one part by volume.

BENZOL

The Benzol submitted shall conform to the following specifications:—

1. *Solubility in water:*—When 10 c. c. of benzol are shaken with an equal volume of water in a glass-stoppered cylindrical graduate divided into tenths of a cubic centimeter and allowed to stand five minutes to separate, the upper or benzol layer of the liquid must measure not less than 9.5 c. c.

2. *Boiling Point:*—When 100 c. c. are subjected to distilling in the following described manner, not more than 1 c. c. should go over at 77° C. and not less than 90 c. c. at 100° C. For benzol in formulas 2b and 23 not more than 1 c. c. should go over at 77° C. and not less than 95 c. c. at 85° C.

One hundred c. c. of benzol are run into a short-necked copper flask of about 180-200 c. c. capacity and the flask placed on an asbestos plate having a circular opening of 30 m. m. diameter. In the neck of this flask is fitted a fractionating tube 12 m. m. wide and 170 m. m. long, with a bulb just 1 centimeter below the side tube, which is connected with a Liebig's condenser having a water jacket not less than 400 m. m. long. In the upper opening of the fractionating tube is placed a standardized thermometer so adjusted that its mercury bulb comes in the center of the bulb. The distillation is conducted in such a manner that 5 c. c. pass over in one minute. The distillate is run into a graduate cylinder, and when the temperature of 100° C. has been reached at the normal barometric pressure of 760 m. m. at least 90 c. c. shall have been collected.

BRUCINE SULPHATE

The brucine sulphate $[(C_{23}H_{26}N_2O_4) \cdot 2H_2SO_4 \cdot 7H_2O]$ — (Henry) dimethoxystrychnine] used must comply with the following specifications:

Physical Properties

Small, white needle-shaped crystals; melting point 168° C. to 176° C.; odorless; taste very bitter. (Caution: Use extreme care in tasting the brucine sulphate.) Note: brucine sulphate sometimes appears in prismatic crystals which are not easily dissolved in alcohol.

Qualitative Identification

A 10% solution of barium chloride added to a solution of brucine sulphate produces a white precipitate, insoluble in hydrochloric acid.

Nitric acid—Stannous chloride test: Concentrated nitric acid dissolves brucine and its salts with a blood-red color. Add a few drops of freshly prepared dilute stannous chloride solution to the reddish solution produced by the nitric acid. An intense violet color will appear (distinction from morphine).

Purity

When dried to constant weight at 110° C. the brucine sulphate should lose not more than 12% of its original weight.

The brucine sulphate shall be free from strychnine when tested by the following method: Dissolve 0.3 gram of brucine sulphate in 15 c. c. of 3% sulphuric acid solution (warm if necessary). Cool solution and add 3 c. c. of a cooled mixture of equal volumes of nitric acid (specific gravity 1.42) and distilled water. After rotating the liquid a few times set aside for exactly 10 minutes, shaking gently three times during the interval. The temperature of the solution should be kept below 25° C. during this operation. The resulting red solution should be transferred immediately to a separatory funnel containing 25 c. c. of an aqueous solution of 10% sodium hydroxide. The contents of the separatory funnel should be cooled to below 25° C. The solution in the separatory funnel must be alkaline. Extract with three successive portions of chloroform of 20 c. c., 10 c. c. and 10 c. c. respectively. Draw off the chloroform through a wetted cotton filter into a white porcelain evaporating dish. Evaporate the combined chloroform extractions to dryness on the water bath, being careful to avoid decrepitation. To the residue add a small crystal of potassium bichromate and approximately 2 c. c. of concentrated sulphuric acid. If strychnine is present the characteristic violet color will appear.

Note: If the brucine contains as much as 0.05% strychnine, a clear distinctive violet color, characteristic of strychnine, will be obtained.

COMMERCIALLY PURE WOOD ALCOHOL

Specific gravity must have a specific gravity of not more than 0.810 at 60° F.

DIETHYLPHTHALATE

Diethylphthalate $C_6H_4(CO_2.C_2H_5)_2$.

Diethylphthalate is colorless, practically without odor and is miscible with alcohol. Boiling point $290-297^{\circ} C$. The ester content should be not less than 99%, determined by the usual saponification method.

Qualitative detection, fluorescein test: Take five (5) drops of Diethylphthalate or 10 c. c. of the $2\frac{1}{2}\%$ solution, place in a small casserole and add 5 c. c. of a 10% solution $NaOH$. Evaporate practically to dryness on a steam bath and then to complete dryness over a low Bunsen flame. Continue heating until the mass is in gentle fusion. Discontinue heating and add at once approximately one-half gram of resorcin. The mass effervesces and turns a dark brown. Place a small portion of this mass in a test tube and add water. The characteristic color of fluorescein develops at once.

This formula should not be used in preparations of an alkaline character, as a chemical reaction will take place which may be detrimental to the finished product.

ERYTHROSINE

The erythrosine used in the above formula will be that described as No. 517 in A. G. Green's edition of the "Schultz-Julius Systematic Survey of the Organic Coloring Matters," published in 1904.

GASOLINE

Volatility and distillation range.—When 5% of the sample has been recovered in the graduated receiver, the thermometer shall not read more than $65^{\circ} C$. ($149^{\circ} F$.) nor less than $50^{\circ} C$. ($122^{\circ} F$.). When 50% has been recovered in the receiver, the thermometer shall not read more than $95^{\circ} C$. ($203^{\circ} F$.).

The distillation test above outlined shall be made in the apparatus and in the manner described in Navy Department Specifications 7G1, dated October 2, 1922, particularly referring to Grade A, fighting aviation gasoline.

ISO-PROPYL ALCOHOL

The iso-propyl or secondary-propyl alcohol used must comply with the following specifications: Specific gravity not more than .82130 at $60^{\circ} F$. The boiling point of the chemically pure iso-propyl alcohol is $82.4^{\circ} C$. The commercial product, however, contains a small amount of water and boils at from $80.4^{\circ} C$. to $81.2^{\circ} C$.

Iso-propyl alcohol may be identified by the method given in Mulliken's "Identification of Pure Organic Compounds," Vol. 1, page 170, test No. 818.

NITROBENZOL

The nitrobenzol submitted shall conform to the following specifications:—

It shall be the commercial grade of nitrobenzene, commonly known as nitrobenzol or oil of mirbane and the specific gravity shall not be less than 1.180 at $60^{\circ} F$.

PETROLEUM NAPHTHA

The naphtha must have a specific gravity of not less than 0.650 nor more than 0.720 at $60^{\circ} F$.

PINE OIL

The pine oil (steam distilled) submitted shall conform to the following specifications:—

It shall be light yellow pine oil, produced by a steam distillation and shall be of a specific gravity not greater than 0.95 at $60^{\circ} F$. It shall be of such a nature as to impart a decided pungent odor and a burning taste to the completely denatured alcohol.

PINE TAR

The tar should respond to the following specifications: A homogeneous dark brown, nearly black liquid, containing no excessive water, should have a specific gravity not to exceed 0.95° . Distillation should begin about 100° C.

PYRIDIN BASES

1. *Color*.—The liquid must meet the same requirements as to color that are imposed upon wood alcohol.

2. *Reaction with cadmium chloride*.—Ten c. c. of a solution of 1 c. c. of pyridin bases in 100 c. c. of water are treated with 5 c. c. of a 5 per cent. water solution of anhydrous fused cadmium chloride, and the mixture vigorously shaken. Within 10 minutes an abundant crystalline separation should take place.

2a. *Behavior with Nessler's reagent*.—With 5 c. c. of Nessler's reagent, 10 c. c. of the same solution of pyridin bases must give a white precipitate.

3. *Boiling point*.—When 100 c. c. are subjected to the determination of the boiling point in the same manner as prescribed for wood alcohol, at least 50 c. c. must distill at 140° C. and at least 90 c. c. at 160° C.

4. *Miscibility with water*.—The same requirements must be met as are imposed upon wood alcohol. (See above.)

5. *Content of water*.—When 20 c. c. of pyridin bases are shaken with 20 c. c. of a solution of caustic soda with a specific gravity of 1.400, and the mixture allowed to stand for some time, at least 18.5 c. c. of the pyridin bases must separate from the solution.

6. *Alkalinity*.—One c. c. of pyridin bases dissolved in 10 c. c. of water are titrated with normal sulphuric acid until a drop of the mixture placed upon Congo paper shows a distinct blue border which soon disappears. It must require not less than 9.5 c. c. of the acid solution to produce the reaction.

The Congo paper is prepared by treating filter paper with a solution of 1 gram of Congo red in 1 liter of water, and drying it.

SULPHURIC ACID

Specific Gravity not less than 1.83 at 60° F.

SULPHURIC ETHER

Specific Gravity not more than 0.728 at 60° F.

TETRACHLORETHANE

The tetrachlorethane authorized to be used in this Formula is the substance acetylene tetrachloride, commonly known as tetrachlorethane having a boiling point of approximately 147° C.

TOBACCO DENATURANT

The tobacco denaturant must conform to the following analytical requirements:

Determination of Nicotine.—It must contain not less than 1.88 per cent. of nicotine when tested by the following process:

20 c. c. of the solution are measured into a 500 c. c. Kjeldahl flask provided with a suitable bulb tube, 10 c. c. of N/10 alkali added, the liquid made up to 50 c. c. and distilled in a current of steam until the distillate is no longer alkaline (about 500 c. c.). The distillate is then titrated with N/10 H_2SO_4 using rosolic acid as an indicator. Not less than 23.2 c. c. should be required for the neutralization.

FOR FORMULA 4

Test of Coloring Matter.—Take 1 c. c. of the denaturant and make up to 100 c. c. with water, acidulating with a few drops of H_2SO_4 . Immerse in this solution a piece of white cotton cloth and boil the solution. Continue the process, adding more cloth and more water if necessary, until all the blue color in the solution is fixed on the cloth. Then add a piece of white woolen cloth, and boil the bath as before until all the yellow color is fixed upon the cloth. Both the cotton and woolen cloths should show decided color—the cotton blue and the woolen yellow.

Intensity of Color.—The denaturant solution, when observed in an eight-inch cell of Lovibond's tintometer, must show a color of an intensity not less than No. 24 yellow, combined with No. 3 blue.

FOR FORMULA 4 ALT.

To Determine the Intensity of Color.—Of the denaturing materials 1 c. c. is diluted with 100 c. c. of water and 50 c. c. of this solution is compared in a 50 c. c. Nessler tube with 50 c. c. of a solution containing 5 grams of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, C.P., in 100 c. c. of water.

WOOD ALCOHOL

The wood alcohol submitted must be partially purified wood alcohol obtained by the destructive distillation of wood. It must conform to the following analytical requirements:

1. *Color.*—This shall not be darker than that produced by a freshly prepared solution of 2 c. c. of N/10 iodine diluted to 1,000 c. c. with distilled water.

2. *Specific gravity.*—It must have a specific gravity of not more than 0.830 at 60° F. (15.56° C.), corresponding to 91° of Tralles's scale.

3. *Boiling point.*—One hundred c. c. slowly heated in a flask under conditions as described below must give a distillate of not less than 90 c. c. at a temperature not exceeding 75° C. at the normal pressure of the barometer (760 m. m.).

One hundred c. c. of wood spirit are run into a short-necked copper flask of about 180-200 c. c. capacity and the flask placed on an asbestos plate having a circular opening of 30 m. m. diameter. In the neck of this flask is fitted a fractionating tube 12 m. m. wide and 170 m. m. long, with a bulb just 1 centimeter below the side tube, which is connected with a Liebig's condenser having a water jacket not less than 400 m. m. long. In the upper opening of the fractionating tube is placed a standardized thermometer, so adjusted that its mercury bulb comes in the center of the bulb. The distillation is conducted in such a manner that 5 c. c. pass over in one minute. The distillate is run into a graduated cylinder, and when the temperature of 75° C. has been reached at the normal barometric pressure of 760 m. m. at least 90 c. c. shall have been collected.

Should the barometer vary from 760 m. m. during the distillation, 1° C. shall be allowed for every variation of 30 m. m. For example, at 770 m. m. 90 c. c. should have distilled at 75.3° C., and at 750 m. m. 90 c. c. should have distilled at 74.7° C.

4. *Miscibility with water.*—It must give a clear or only slightly opalescent solution when mixed with twice its volume of water.

5. *Acetone content.*—It must contain not more than 20 or less than 10 grams per 100 c. c. of acetone and other substances estimated as acetone when tested by the following method (Messinger):

One c. c. of a mixture of 10 c. c. wood alcohol with 90 c. c. of water is treated with 10 c. c. of double normal soda solution. Then 50 c. c. of N/10 iodine solution are added while shaking, and the mixture made acid with dilute sulphuric acid three minutes after

the addition of the iodine. The excess of iodine is titrated back with N/10 sodium thiosulphate solution, using a few drops of starch solution for an indicator. From 10.3 to 20.7 c. c. of N/10 iodine solution should be used by the spirit.

The solution should be kept at a temperature between 15° and 20° C.

Calculation: X = grams of acetone in 100 c. c. of spirit.

Y = number of c. c. of N/10 iodine solution required.

N = volume of spirit taken for titration.

$$Y \times 0.096672$$

$$\text{Then } X = \frac{\quad}{N}.$$

Optional method for acetone: Take 10 c. c. of wood alcohol dilute to 500 c. c. with water in a 500 c. c. graduate glass-stoppered flask; thoroughly mix. Take 5 c. c. of this mixture, using a standardized pipette (proceed as usual).

It is recommended that whichever method is used the authorized chemist carry a blank test made up of a solution of pure acetone in methyl alcohol in the proportion of about 16 grams of acetone made up to 100 c. c., and when each determination is made a blank be run; then add to the amount of acetone found in the sample under examination the difference between the known value of the blank and the titrated blank.

6. *Esters.*—It should contain not more than 5 grams of esters per 100 c. c. of spirit, calculated as methyl acetate and determined as follows:

Ten c. c. of wood alcohol, diluted to 500 c. c. with water in 500 c. c. graduate glass-stoppered flask; thoroughly mix; 100 c. c. of this mixture is run into a flask and 50 c. c. deci-normal sodium hydrate, free from carbonates, is added and the flask connected with a reflux condenser and boil for one hour. Instead of digesting at boiling temperature the flasks may be allowed to stand overnight at room temperature and then heated on a steam bath for thirty minutes with an ordinary tube condenser. The liquid after digestion is cooled and titrated with normal sulphuric acid, using phenolphthalein as an indicator.

$$\left. \begin{array}{l} \text{Methyl acetate} = \\ \text{grams per 100 c. c. of} \\ \text{spirit} \end{array} \right\} = \frac{.0074 \times \text{c. c. of N/10 soda required} \times 100}{2 \text{ c. c. spirit taken}}$$

7. *Bromine absorption.*—It must contain a sufficient quantity of impurities derived from the wood so that not more than 25 c. c. or less than 15 c. c. shall be required to decolorize a standard solution containing .5 gram of bromine, as follows:

The standard bromine solution is made by dissolving 12.406 grams of potassium bromide and 3.481 grams of potassium bromate (which is of tested purity and has been dried for two hours at 100° C.) in a liter of water. Fifty c. c. of the standard solution containing .5 gram of bromine are placed in a glass-stoppered flask having a capacity of about 200 c. c. This is acidified by the addition of 10 c. c. of diluted sulphuric acid (1 to 4), and the whole shaken and allowed to stand a few minutes. The wood alcohol is then allowed to flow slowly into the mixture, drop by drop, rate of flow not to exceed 5 c. c. per minute, from a burette until the color is entirely discharged. The temperature of the mixture should be 20° C.

In addition to the above requirements the wood alcohol must be of such a character as to render the ethyl alcohol with which it mixed unfit for use as a beverage.



DENATURED ALCOHOL

FOR

ANTI-FREEZING PURPOSES

PYRO Denatured Alcohol when used to prevent the freezing of water in the radiators of internal combustion engines gives excellent results.

Every motorist operating a water-cooled car should realize that the cooling medium in the cylinders and radiator is able to freeze as soon as the temperature goes below 32° Fahrenheit. There is but one way by which this natural result can be avoided and that is by the addition of materials to the cooling water which will lower its freezing temperature. Of the materials tried for the purpose, *Pyro Denatured Alcohol* has for years been found the best for various reasons, among the more important of which are ECONOMY, SAFETY and ABSOLUTE RELIABILITY. The use of such materials as kerosene, salt, calcium chloride or glycerine, or proprietary compounds containing one or more of those agents, means the rapid deterioration of the radiating system, aside from fire hazard injuring the rubber hose connections, etc., glycerine, particularly, being most objectionable in this latter regard.

If the motorist does not know the capacity of his radiating system in gallons, it is advisable for him to thoroughly drain the radiator and then fill it completely with water, keeping a record of the number of gallons used; then, by withdrawing from the radiator a certain measured quantity of water and replacing it with *Pyro Denatured Alcohol*, a solution resisting the desired freezing temperature will be obtained.

Denatured alcohol as an auto freeze for automobile is recommended by such authorities as the U. S. Bureau of Standards, The American Chemical Society and the most prominent automobile manufacturers of the country.

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The standard bromine solution is made by dissolving 12.46 grams of potassium bromide and 3.481 grams of potassium bromate (which is of tested purity and has been dried for two hours at 100° C.) in a liter of water. Fifty c. c. of the standard solution containing .5 gram of bromine are placed in a glass-stoppered flask having a capacity of about 200 c. c. This is acidified by the addition of 10 c. c. of diluted sulphuric acid (1 to 4), and the whole is shaken and allowed to stand a few minutes. The wood alcohol is then allowed to flow slowly into the mixture, drop by drop, rate of flow not to exceed 5 c. c. per minute, from a burette until the color is entirely discharged. The temperature of the mixture should be 20° C.

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Denatured alcohol as an auto freeze for automobile use is recommended by such authorities as the U. S. Bureau of Standards, The American Chemical Society and the most prominent automobile manufacturers of the country.



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RADIATORS	MOTOR POWER
BLENDED FUELS	OIL REFINING
BRONZING FLUIDS	PAINTS
CARBON REMOVER	PAINT AND VARNISH
CARTRIDGES	PREPARING SUBJECTS FOR
CEMENTS	EXHIBITION PURPOSES
CHAFING DISHES	SHOE BLACKING, ETC.
CLEANING AND POLISHING	SOAP
BRASS, GLASS, SILVER,	SOLDERING FLUX
SHOES, ETC.	SOLIDIFIED ALCOHOL
CLEANING FABRICS	STARCH
DIPPING FLUIDS	STARTING GASOLINE LAMPS
DISINFECTANTS	TANNING
DYES, STAINS	TESTING FRUIT
ENAMELS	VARNISHES
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